

Amendments to the Drawings:

The attached sheet of drawings includes changes to Fig. 1 and 2, in which the reference numerals 13, 13a, 17, 22 and 23 have been added.

Attachment: Replacement Sheet

Annotated Sheet Showing Changes

REMARKS

In response to the objection to Claims 3-14, as set forth in item 4 on page 3 of the Office Action, the claims have been amended to replace the word "An" with "The" as required. Accordingly, reconsideration and withdrawal of this ground of objection are respectfully requested.

The drawings have been objected to under 37 C.F.R. §1.83(a) for failing to show every feature of the invention specified in the claims. In response to these grounds of objection, Applicants have submitted herewith replacement sheets bearing Figures 1 and 2, in which reference numerals 13, 13a, 17, 22 and 23 have been added. In response to the individual items set forth under the heading "Drawings" on pages 3 and 4 of the Office Action, Applicants provides the following further explanation.

The "stowed position" recited in Claim 1 is shown in Figure 1, in which the second boom 15 and the antenna 16 are shown in the stowed position. This feature of the invention is discussed at page 8, lines 4-23.

With regard to the phrase "four single-axis hingedly-connected joints", Applicants have cancelled Claim 4. In addition, Applicants note that the articulated stepper motor harmonic drive unit of Claim 5 and the spring operated mechanical hinge of Claim 6 are shown in the drawing, as elements 13

and 13a, which reference numerals have been added to the specification at page 7, lines 29 and 30. Claims 7 and 8, on the other hand, have been canceled.

The metal brackets of Claim 11 are shown in Figure 1 of the drawing, now indicated by the reference numeral 22, which has also been added to the specification at page 9, line 3. The plurality of hold-down points, referred to in Claim 13 can be seen in Figure 1 of the drawing, are now designated by the reference numeral 23, which has also been inserted into the specification at page 8, line 19. Finally, Claim 14 has been amended to delete the reference to "predetermined directions". Accordingly, reconsideration and withdrawal of these grounds of objection are respectfully requested.

Claims 1-14, 17, 18 and 20-21 have been rejected under 35 U.S.C. §112, second paragraph for failing to particularly point out and distinctly claim the invention, based on certain formal issues identified in item 6 on pages 4-5 of the Office Action. As a preliminary matter, Applicants note with regard to this ground of rejection that although it is indicated to apply to all of Claims 1-14 no grounds of rejection are stated with regard to Claim 1, 10 or 11. Also, with regard to Claims 15, 17 and 18, Applicants note that the next to the last paragraph on page 5 of the Office Action indicates that the deficiencies found in line 1 of Claims 17-18 are required similar clarifications to Claim 15. This sentence is not understood, as there are no deficiencies mentioned in the Office Action with regard to Claims 17 and 18 and no clarifications have been indicated

with regard to Claim 15. Accordingly, Applicants are unable to respond to this ground of rejection, and clarification is respectfully requested.

In further response to the formal grounds of rejection in item 6 on pages 4 and 5 of the Office Action, Applicants note that Claims 3 and 4 have been cancelled. However, the substance of Claim 3 has been incorporated into Claim 1, albeit in somewhat modified form. With regard to the word "dog-leg" Applicants note that this term is defined in the dictionary, having the meaning "crooked or bent like a dog's hind leg". Accordingly, Applicants respectfully submit that this phrase is not indefinite. Moreover, its meaning and significance in the context of the present application is discussed in detail at page 3, lines 4-22 which states that "the term 'dog-leg' in the proposed boom design is used to mean or cover any bend or curve in the boom which allows the boom structure to follow the circumference/periphery of the reflector (which it carries)...." Accordingly, Applicants respectfully submit that a person skilled in the art would clearly understand the meaning of this term as used in Claim 1, and that Claim 1 therefore is clear and definite.

The dog-leg according to the present invention is illustrated in Figures 1 and 2, and has now been designated by the reference numeral 17. The bend or curve in the boom 15 is best seen with regard to the boom 15 in Figure 1. It can also be seen in the boom 5, which, however, shows only a slight bend due to the viewing angle. The specification has been amended to insert the reference

numeral 17 as well. Accordingly, reconsideration and withdrawal of this ground of rejection are respectfully requested.

The rejection of Claims 7-9 has been rendered moot by cancellation of those claims.

Finally, Applicants note that an antecedent basis for the term "the spacecraft", which now appears in Claims 12-14, has been incorporated into Claim 1. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested as well.

Claims 1-4 have been rejected as anticipated by Nguyen et al (U.S. Patent No. 6,124,835). Applicants note in this regard that none of the remaining claims contained in this application have been rejected on prior art grounds. In addition, it is also noted that Claims 2-4 have been cancelled. Accordingly, Claim 1 is the only claim which remains of record that has been rejected on prior art grounds. For the reasons set forth hereinafter, Applicants respectfully submit that Claim 1 as amended distinguishes over Nguyen et al.

The present invention is directed to an articulated boom for a space based antenna reflector system of the type having an antenna reflector supported on a boom which is deployable outwardly from the spacecraft. The boom includes a support arm that has a plurality of hinged joints and is adapted to carry the

antenna reflector, so that in use, it can be moved between a first (stowed) position in which the reflector is nested within a predetermined volume of the spacecraft, and a second (deployed) position in which the reflector is deployed in space outside the predetermined volume. Claim 1 as amended recites that the support arm includes a dog-leg portion that is configured and positioned such that it extends at least partially along a circumference of the antenna reflector when the antenna reflector is in the stowed position. (See, for example, the support arm 15 in Figure 1.)

The latter feature of the invention is not taught or suggested by the Nguyen et al patent. Rather, in Nguyen et al, the reflector antenna system includes a main reflector 38 and a subreflector 40 which are supported on respective antenna arm assemblies 30 and 32, which are connected by a hinge joint 34. The two antenna arms 30 and 32 are in turn connected by a hinge 28 to the antenna structure 12. In the stowed position, the antenna arm 32 is folded counterclockwise to a position adjacent the antenna arm 30, and the two antenna arms are then folded about the hinge 28 to a position adjacent the feed array 16, as shown in Figure 1.

When the reflector antenna system is deployed, the assembly comprising the antenna arms 30 and 32 is first rotated in the plane of the drawing, in a clockwise direction about the hinge 28. Thereafter, the antenna arm 32 is

rotated about the hinge 34 in a clockwise direction to the antenna arm 30, so that it assumes the position in Figure 3.

As can be seen from the foregoing brief description, the Nguyen et al reference does not include those features of the invention defined in the last two paragraphs of Claim 1. While both the antenna reflector arms 30 and 32 include bent portions, neither of them is "configured and positioned such that it extends at least partially along a circumference of the antenna reflector, when said antenna reflector is in said stowed position". The latter feature of the invention achieves important advantages, in that it is extremely efficient in the use of space within the spacecraft in the stowed position of the antennas. In particular, it allows two separate reflectors, carried on two separate support arms 5, 15, to be stowed in very close proximity to each other. This feature therefore makes it easier to accommodate the spacecraft within the launch vehicle fairing, as discussed at page 3, lines 19-22 and page 5, lines 18-21. Moreover, as noted at page 6, lines 7-12, such stacking of the antenna reflectors, with the arms of the booms disposed along the circumference of the antenna reflectors, has the advantage that there is no physical interference between the different component parts of the booms.

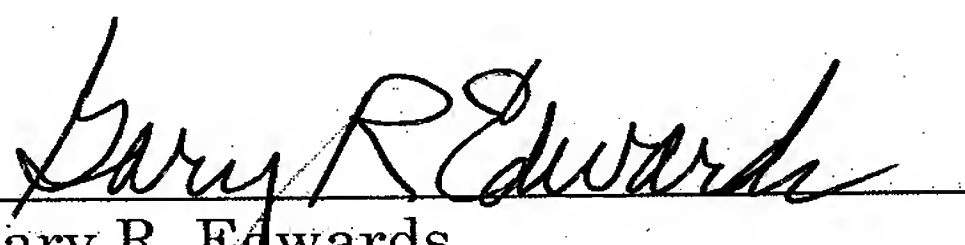
Accordingly, Applicants respectfully submit that Claim 1 as amended distinguishes over the Nguyen et al patent.

Finally, in view of the allowability of Claim 1 which is generic, Applicants respectfully request that the remaining claims, treated in the Office Action as non-elected, be reinstated and allowed for the reasons noted above.

In light of the foregoing remarks, this application should be in consideration for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #101806.56312US).

Respectfully submitted,


Gary R. Edwards
Registration No. 31,824

CROWELL & MORING LLP
Intellectual Property Group
P.O. Box 14300
Washington, DC 20044-4300
Telephone No.: (202) 624-2500
Facsimile No.: (202) 628-8844
GRE:kms
Attachments: Replacement Sheets (Figures 1 and 2)
6449787_1